



General

Guideline Title

Emergency tracheal intubation immediately following traumatic injury: an Eastern Association for the Surgery of Trauma practice management guideline.

Bibliographic Source(s)

Mayglothling J, Duane TM, Gibbs M, McCunn M, Legome E, Eastman AL, Whelan J, Shah KH, Eastern Association for the Surgery of Trauma. Emergency tracheal intubation immediately following traumatic injury: an Eastern Association for the Surgery of Trauma practice management guideline. J Trauma Acute Care Surg. 2012 Nov;73(5 Suppl 4):S333-40. [94 references] [PubMed](#)

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Eastern Association for the Surgery of Trauma (EAST). Guidelines for emergency tracheal intubation immediately following traumatic injury. Allentown (PA): Eastern Association for the Surgery of Trauma (EAST); 2002. 80 p. [261 references]

Regulatory Alert

FDA Warning/Regulatory Alert

Note from the National Guideline Clearinghouse: This guideline references a drug(s) for which important revised regulatory and/or warning information has been released.

- [December 14, 2016 – General anesthetic and sedation drugs](#) : The U.S. Food and Drug Administration (FDA) is warning that repeated or lengthy use of general anesthetic and sedation drugs during surgeries or procedures in children younger than 3 years or in pregnant women during their third trimester may affect the development of children's brains. Consistent with animal studies, recent human studies suggest that a single, relatively short exposure to general anesthetic and sedation drugs in infants or toddlers is unlikely to have negative effects on behavior or learning. However, further research is needed to fully characterize how early life anesthetic exposure affects children's brain development.

Recommendations

Major Recommendations

The classes of evidence (I-III) and levels of recommendation (1-3) are defined at the end of the "Major Recommendations" field.

Airway Assessment

Level 1

There were no recommendations.

Level 2

The recommendations are as follows:

1. A careful airway assessment should be performed before initiating efforts to secure the airway. The goals of this assessment are to identify potential markers of difficulty with the following:
 - a. Bag-valve mask ventilation
 - b. Laryngoscopy
 - c. Surgical airway.
2. The application of structured assessment tools (e.g., the LEMON* law) is recommended.
3. When significant difficulty is anticipated, neuromuscular blockade should be used with caution, and airway rescue devices, including surgical airway equipment, should be immediately available.

*The LEMON mnemonic is an assessment tool used in the current (eighth) version of advanced trauma life support:

L: Look externally (facial trauma, large incisors, beard or moustache, large tongue)

E: Evaluate the 3-3-2 rule (incisor distance < 3 fingers, hyoid mental distance < 3 fingers, thyroid to mouth < 2 fingers)

M: Mallampati score

O: Obstruction (presence of any condition that could cause obstruction)

N: Neck mobility (all patients with blunt trauma require cervical in-line stabilization that makes visualization of the glottis more difficult)

Level 3

There were no recommendations.

Indications for Emergency Tracheal Intubation (ETI)

Level 1

1. ETI is indicated in trauma patients with the following traits:
 - a. Airway obstruction
 - b. Hypoventilation
 - c. Persistent hypoxemia (arterial oxygen saturation [SaO₂] ≤90%) despite supplemental oxygen
 - d. Severe cognitive impairment (Glasgow Coma Scale [GCS] score ≤8)
 - e. Severe hemorrhagic shock
 - f. Cardiac arrest
2. ETI is indicated for patients experiencing smoke inhalation with any of the following traits:
 - a. Airway obstruction
 - b. Severe cognitive impairment (GCS score ≤8)
 - c. Major cutaneous burn (≥40%)
 - d. Major burns and/or smoke inhalation with an anticipated prolonged transport time to definitive care
 - e. Impending airway obstruction as follows:
 - i. Moderate-to-severe facial burn
 - ii. Moderate-to-severe oropharyngeal burn
 - iii. Moderate-to-severe airway injury seen on endoscopy

Level 2

There were no recommendations.

Level 3

3. ETI may also be indicated in trauma patients with any of the following traits:
 - a. Facial or neck injury with the potential for airway obstruction
 - b. Moderate cognitive impairment (GCS score >9–12)
 - c. Persistent combativeness refractory to pharmacologic agents
 - d. Respiratory distress (without hypoxia or hypoventilation)
 - e. Preoperative management (i.e., patients with painful injuries or undergoing painful procedures before nonemergent operation)
 - f. Early ETI is indicated in cervical spinal cord injury (SCI) with any evidence of respiratory insufficiency (complete cervical SCI or incomplete injuries C5 and above)

Procedural Options

Level 1

1. Orotacheal intubation guided by direct laryngoscopy (DL) is the ETI procedure of choice for trauma patients.
2. Rapid sequence intubation (RSI) should be used to facilitate orotracheal intubation unless markers of significant difficulty with intubation are present. An RSI drug regimen should be given to achieve the following clinical objectives:
 - a. Adequate sedation and neuromuscular blockade
 - b. Maintenance of hemodynamic stability and central nervous system (CNS) perfusion
 - c. Maintenance of adequate oxygenation
 - d. Prevention of increases in intracranial hypertension
 - e. Prevention of vomiting and aspiration

There are no recommendations regarding the use of specific induction agents used for RSI in trauma. Succinylcholine is the recommended agent of choice for neuromuscular blockade, in the absence of any contraindications to its use.

3. Enhancements for safe and effective ETI in trauma patients include the following:
 - a. Availability of experienced personnel
 - b. Pulse-oximetry monitoring
 - c. Maintenance of cervical neutrality
 - d. Confirmation of tube placement using auscultation of bilateral breath sounds and end-tidal carbon dioxide (CO₂) detection
 - e. Continuous end-tidal CO₂ monitoring for patients with severe traumatic brain injury
4. Cricothyroidostomy is appropriate when emergent/urgent tracheal intubation is needed and cannot be achieved rapidly with DL or with the use of alternative airway techniques and devices.

Level 2

5. When ETI cannot be achieved rapidly with DL, a number of airway rescue devices may be used as follows:
 - a. Blind-insertion supraglottic devices (i.e., laryngeal mask airway [LMA], Combitube, and King Airway)
 - b. Gum-elastic bougie
 - c. Video laryngoscopy
 - d. Surgical cricothyroidostomy

Decisions regarding the most appropriate rescue technique should be guided by the clinical scenario at hand, resource availability, and the skill and experience of the treating clinician.

Level 3

6. Video laryngoscopy may offer significant advantages over DL, including the following:
 - a. Superior views of the glottis (Cormack-Lehane I/II)
 - b. Higher intubation success rates for patients with anatomically difficult airways, in obese patients, and in those with the cervical spine held in-line
 - c. Higher intubation success rates by inexperienced airway providers.

Definitions:

Classes of Evidence

Class I: Prospective randomized controlled trial.

Class II: Prospective clinical trial or retrospective analysis based on reliable data.

Class III: Retrospective case series or database review.

Levels of Recommendations

Level 1: The recommendation is convincingly justifiable based on the available scientific information alone. This recommendation is usually based on Class I data; however, strong Class II evidence may form the basis for a Level 1 recommendation, especially if the issue does not lend itself to testing in a randomized format.

Level 2: The recommendation is reasonably justifiable by available scientific evidence and strongly supported by expert opinion. This recommendation is usually supported by Class II data or a preponderance of Class III evidence.

Level 3: The recommendation is supported by available data but adequate scientific evidence is lacking. This recommendation is generally supported by Class III data. This type of recommendation is useful for educational purposes and in guiding future clinical research.

Clinical Algorithm(s)

None provided

Scope

Disease/Condition(s)

Traumatic injury and potential/actual respiratory system insufficiency

Guideline Category

Evaluation

Management

Treatment

Clinical Specialty

Anesthesiology

Emergency Medicine

Surgery

Intended Users

Advanced Practice Nurses

Allied Health Personnel

Emergency Medical Technicians/Paramedics

Nurses

Physician Assistants

Physicians

Guideline Objective(s)

- To assist clinicians with decisions regarding airway management for patients immediately following traumatic injury
- To develop evidence-based guidelines to characterize patients in need of emergency tracheal intubation (ETI) and to delineate the most appropriate procedure for patients undergoing ETI
- To update prior guidelines by the Eastern Association for the Surgery of Trauma (EAST), which were last reviewed in 2002

Target Population

Patients requiring emergency tracheal intubation (ETI) for various reasons following traumatic injury including hypoxia, hypoventilation, or failure to maintain or protect the airway owing to altered mental status

Interventions and Practices Considered

1. Airway assessment
 - Careful airway assessment should be performed before initiating efforts to secure the airway
 - Use of a structured assessment tool (e.g., the LEMON law)
 - Cautious use of neuromuscular blockade when difficulty is anticipated
 - Availability of airway rescue devices, including surgical airway equipment
2. Assessment of indication traits for emergency tracheal intubation (ETI) after trauma
3. ETI procedural options
 - Orotracheal intubation (OTI) guided by direct laryngoscopy (DL)
 - OTI facilitated by rapid sequence intubation (RSI)
 - Enhancements for safe and effective ETI (availability of experienced personnel, pulse-oximetry monitoring, maintenance of cervical neutrality, confirmation of tube placement using auscultation of bilateral breath sounds and end-tidal carbon dioxide [CO₂] detection, continuous end-tidal CO₂ monitoring)
 - Cricothyroidostomy
 - Blind-insertion supraglottic devices
 - Gum-elastic bougie
 - Video laryngoscopy

Major Outcomes Considered

- Success and failure rates of emergency tracheal intubation (ETI)
- Patient morbidity and mortality

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Studies appropriate for the emergency tracheal intubation (ETI) update were identified using MEDLINE. An initial database query was undertaken using the same search criteria that were used in the original practice management guideline (PMG) with citations published between January 2001

and December 2011. This included a combination of the National Library of Medicine's Medical Subject Headings (MeSH) and title words with limits to English-language, human, all ages, and all study types: hypercarbia, airway obstruction, hypoventilation, aspiration, psychomotor agitation, hypoxia, injury/injuries, trauma/traumatic, brain, head, intubation, endotracheal, tracheostomy, cricothyroidostomy, cricothyroidotomy, and cricothyrotomy. Given the specific questions posed by the work group, additional search terms were used: video-assisted laryngoscopy, videolaryngoscopy, laryngeal mask airway, King LT, Combi-tube, and cricoid pressure.

In addition to the MEDLINE search, bibliographies of reviews, letters to the editor, and meta-analyses were used to identify other relevant patient investigation articles. If an article investigated trauma and medical patients, the article was included if the trauma patient cohort was at least 50% or if the study included a subgroup analysis on the specific trauma population.

The initial search identified 2,688 citations. Letters to the editor, case reports, reviews, and articles dealing with airway training using simulation were excluded. The abstracts of the remaining citations were reviewed, and those articles that did not address the issues pertinent to the questions outlined previously were further excluded. In total, 93 citations met the inclusion criteria. These were distributed to members of the committee for review, and ultimately, 69 were included in the analysis. Citations were cross-referenced to the 2002 document to ensure that no articles included in the original database were repeated.

Number of Source Documents

A breakdown of the 69 articles included in the analysis:

- Population appropriate for intubation (11 articles)
- Prehospital care (36 articles)
- Pharmacologic agents (7 articles)
- Airway adjuncts and video-assisted laryngoscopy (9 articles)
- Other (6 articles)

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Class I: Prospective randomized controlled trial.

Class II: Prospective clinical trial or retrospective analysis based on reliable data.

Class III: Retrospective case series or database review.

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review

Description of the Methods Used to Analyze the Evidence

Articles were classified as Class I, II, or III as described in the Eastern Association for the Surgery of Trauma (EAST) "Utilizing evidence based outcome measures to develop practice management guidelines: a primer" (see the "Availability of Companion Documents" field).

Three articles were classified as Class I, 13 articles as Class II and 53 articles as Class III.

Methods Used to Formulate the Recommendations

Description of Methods Used to Formulate the Recommendations

In creating the updated guidelines for emergency tracheal intubation (ETI), committee members, with recognized expertise in trauma surgery, emergency medicine, and anesthesiology, formulated specific questions to be addressed during the assessment and revision process.

1. Are the 2002 guidelines still valid, and is there any new evidence to change the level of the previous recommendations?
2. Is direct laryngoscopy (DL) still the preferred method for ETI in trauma?
3. What is the role of newly introduced airway adjuncts, such as blind insertion supraglottic devices and video laryngoscopy?
4. Are there pharmacologic agents used for intubation that should be recommended for or against in the setting of acute injury?
5. What is the role of prehospital ETI?

Recommendations were classified as level 1, 2, or 3 according to the definitions listed in the "Rating Scheme for the Strength of the Recommendations" field.

Rating Scheme for the Strength of the Recommendations

Level 1: The recommendation is convincingly justifiable based on the available scientific information alone. This recommendation is usually based on Class I data; however, strong Class II evidence may form the basis for a Level 1 recommendation, especially if the issue does not lend itself to testing in a randomized format.

Level 2: The recommendation is reasonably justifiable by available scientific evidence and strongly supported by expert opinion. This recommendation is usually supported by Class II data or a preponderance of Class III evidence.

Level 3: The recommendation is supported by available data but adequate scientific evidence is lacking. This recommendation is generally supported by Class III data. This type of recommendation is useful for educational purposes and in guiding future clinical research.

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Not stated

Description of Method of Guideline Validation

Not applicable

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for each recommendation (see the "Major Recommendations" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

- Selection of appropriate types of patients and procedures for tracheal intubation immediately following traumatic injury
- Improved success rates for emergency intubation
- Recognition of specific attributes of the difficult airway allow for better preparation and potentially preventable adverse consequences

Potential Harms

- Emergency tracheal intubation (ETI) has the potential to cause secondary injury if performed inadequately or unsuccessfully by creating or exacerbating hypoxia or hypotension.
- Although many emergency intubations are straightforward, as many as 0.3% to 2.7% result in "failed airways" in the setting of trauma.
- Intubation in patients with combativeness is not without risk. One reported study demonstrated that patients intubated for combativeness as the only indication have longer stay, an increased incidence of pneumonia, and poorer discharge status when compared with matched controls. However, given the risk of significant head injury and the importance of being able to complete a thorough trauma evaluation, persistent combativeness that inhibits the ability to adequately evaluate potential injuries and that is refractory to safe pharmacologic management is included in the criteria for ETI.

Contraindications

Contraindications

Contraindications to succinylcholine include prolonged immobilization, chronic kidney disease, or skeletal muscle myopathies; high-dose rocuronium is the preferred alternative in patients with these contraindications.

Qualifying Statements

Qualifying Statements

- The Eastern Association for the Surgery of Trauma (EAST) is a multi-disciplinary professional society committed to improving the care of injured patients. The Ad hoc Committee for Practice Management Guideline Development of EAST develops and disseminates evidence-based information to increase the scientific knowledge needed to enhance patient and clinical decision-making, improve health care quality, and promote efficiency in the organization of public and private systems of health care delivery. Unless specifically stated otherwise, the opinions expressed and statements made in this publication reflect the authors' personal observations and do not imply endorsement by nor official policy of the Eastern Association for the Surgery of Trauma.
- "Clinical practice guidelines are systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances." * These guidelines are not fixed protocols that must be followed, but are intended for health care professionals and providers to consider. While they identify and describe generally recommended courses of intervention, they are not presented as a substitute for the advice of a physician or other knowledgeable health care professional or provider. Individual patients may require different treatments from those specified in a given guideline. Guidelines are not entirely inclusive or exclusive of all methods of reasonable care that can obtain/produce the same results. While guidelines can be written that take into account variations in clinical settings, resources, or common patient characteristics, they cannot address the unique needs of each patient nor the combination of resources available to a particular community or health care professional or provider. Deviations from clinical practice guidelines may be justified by individual circumstances. Thus, guidelines must be applied based on individual patient needs using professional judgment.

*Institute of Medicine. Clinical practice guidelines: directions for a new program. MJ Field and KN Lohr (eds) Washington, DC: National Academy Press. 1990: pg 39.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

IOM Domain

Effectiveness

Timeliness

Identifying Information and Availability

Bibliographic Source(s)

Mayglothling J, Duane TM, Gibbs M, McCunn M, Legome E, Eastman AL, Whelan J, Shah KH, Eastern Association for the Surgery of Trauma. Emergency tracheal intubation immediately following traumatic injury: an Eastern Association for the Surgery of Trauma practice management guideline. J Trauma Acute Care Surg. 2012 Nov;73(5 Suppl 4):S333-40. [94 references] [PubMed](#)

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2002 (revised 2012 Nov)

Guideline Developer(s)

Eastern Association for the Surgery of Trauma - Professional Association

Source(s) of Funding

Eastern Association for the Surgery of Trauma (EAST)

Guideline Committee

EAST Practice Management Guidelines Committee

Composition of Group That Authored the Guideline

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Financial Disclosures/Conflicts of Interest

The authors declare no conflicts of interest.

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Guideline Availability

Electronic copies: Available from the [Eastern Association for the Surgery of Trauma \(EAST\) Web site](#) .

Print copies: Available from the EAST Guidelines, c/o Julie Mayglothling MD, Virginia Commonwealth University Medical Center, Richmond, VA; email: jmayglothling@mcvh-vcu.edu.

Availability of Companion Documents

The following is available:

- Utilizing evidence based outcome measures to develop practice management guidelines: a primer. 2000. 18 p. Available in Portable Document Format (PDF) from the [Eastern Association for the Surgery of Trauma \(EAST\) Web site](#) .

Patient Resources

None available

NGC Status

This NGC summary was completed by ECRI on October 10, 2002. The information was verified by the guideline developer on November 18, 2002. This summary was updated by ECRI Institute on April 5, 2013. The updated information was verified by the guideline developer on May 1, 2013. This summary was updated by ECRI Institute on February 15, 2017 following the U.S. Food and Drug Administration advisory on general anesthetic and sedation drugs.

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